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Stanford B. Hooker, Editor
NASA Goddard Space Flight Center, Greenbelt, Maryland

Elaine R. Firestone, Senior Scientific Technical Editor
Science Applications International Corporation, Beltsville, Maryland

Volume 22, Algorithm Updates for the Fourth SeaWiFS Data Reprocessing

Frederick S. Patt, Robert A. Barnes, Robert E. Eplee, Jr., Bryan A. Franz, and Wayne D. Robinson
Science Applications International Corporation, Beltsville, Maryland

Gene Carl Feldman
NASA/Goddard Space Flight Center, Greenbelt, Maryland

Sean W. Bailey and Joel Gales
Futuretech Corporation, Greenbelt, Maryland

P. Jeremy Werdell
Science Systems and Applications, Incorporated, Lanham, Maryland

Menghua Wang
University of Maryland, Baltimore County, Baltimore, Maryland

Robert Frouin
Scripps Institution of Oceanography, La Jolla, California

Richard P. Stumpf
NOAA Center for Coastal Monitoring and Assessment, Silver Spring, Maryland

Robert A. Arnone, Richard W. Gould, Jr., and Paul M. Martinolich
Naval Research Lab, Stennis, Mississippi

Varis Ransibrahmanakul
SPS Technologies, Silver Spring, Maryland

John E. O'Reilly
NOAA National Marine Fisheries Service, Narragansett, Rhode Island

James A. Yoder
University of Rhode Island, Narragansett, Rhode Island

Chapter 7

Level-1a and Level-3 Processing Changes

Frederick S. Patt, Bryan A. Franz, and Wayne D. Robinson
Science Applications International Corporation
Beltsville, Maryland

Joel Gales
Futuretech Corporation
Greenbelt, Maryland

Abstract

Improvements were made in the level-1a and level-3 data processing for the fourth reprocessing. Two of these—handling of the spacecraft time tag anomalies, and modification of the level-3 space binning program—address specific problems in the data and processing logic, which excluded otherwise valid data from processing. The third improvement, an update to the navigation algorithms, improves the overall data quality by reducing the maximum navigation errors. The net effect of these changes is an increase both in coverage and quality of the SeaWiFS data products.

7.1 INTRODUCTION

This chapter describes changes that were made in the level-1a and level-3 data processing software as part of the fourth reprocessing. These changes were implemented independently of the level-2 algorithm updates which are described in the previous chapters. They represent either solutions to known problems in the previous versions of the processing software, or results of ongoing analysis of data quality.

The first of these changes is a method for handling anomalies, or *glitches*, in the spacecraft time tag during level-1a processing. These glitches have resulted in significant navigation errors, which previously could only be handled by excluding entire scenes from further processing. As a result, significant amounts of valid data were also excluded to avoid including the misnavigated periods. The new scheme both corrects simple time glitches and allows specific, uncorrected periods to be flagged within scenes, minimizing the loss of data.

As another part of the level-1a processing, improvements were made to the navigation algorithms to reduce the seasonal variations in accuracy. This update was actually made to the operational software in April 2001, but the fourth reprocessing was the first opportunity to apply it to the entire mission. In addition, a problem was identified and corrected in the initial level-3 processing (space binning) logic, which excluded some level-2 files from binning. Each of these changes is described in the following sections.

7.2 TIME TAG GLITCH HANDLING

The data stream produced by the OrbView-2 spacecraft contains a time tag for each level-0 data record, or minor frame. (A level-0 minor frame contains either one LAC scan line or five GAC scan lines, along with associated spacecraft and instrument telemetry.) In addition, the telemetry data contain time tags for various spacecraft subsystems. The spacecraft minor frame time tag is used during level-0-to-1A processing to compute the scan line time, which in turn is used in the determination of the spacecraft navigation fields (orbit position and attitude angles).

Various types of time tag glitches have been observed during the mission. The most serious are those that involve the minor frame time tag. A 1 s error in this time tag results in a pixel location error of 6.75 km, or 6 LAC pixels. Glitches that only affect other time tags (e.g., for telemetry fields) have little or no effect, and are largely handled in the processing software by data quality checks. Note that the glitches discussed here originate on the spacecraft, and affect all data types—GAC, LAC, and HRPT—when they occur. Time tag glitches may also be caused by data transmission errors, but these glitches are source dependent (specific ground station, and recorded versus direct broadcast) and are handled by data quality checks.

The types of minor frame time tag glitches are discussed in more detail below, followed by a description of the procedure implemented for handling the time glitches.